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Pinellas Environmental Restoration Project
Northeast Site Non-Aqueous Phase Liquids
Interim Measures Progress Report

July through September 2002

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Prepared by
U.S. Department of Energy
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Contents

Acronyms and Abbreviations

CMIP	Corrective Measures Implementation Plan
CMS	Corrective Measures Study
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ERH	electrical resistive heating
FDEP	Florida Department of Environmental Protection
ft	feet
ICM	interim corrective measures
IMW	Interim Measures Work (Plan)
MCL	maximum contaminant level
NAPL	non-aqueous phase liquid
psi	pounds per square inch
SES	SteamTech Environmental Services
SI	steam injection
STAR	Science, Technology, and Research

1.0 Introduction

In the late 1960s, before construction of the East Pond, drums of waste and construction debris were disposed of in the swampy area of the Northeast Site. The East Pond was excavated in 1968 as a borrow pit. In 1986, an expansion of the East Pond was initiated to create additional storm-water retention capacity. Excavation activities ceased when contamination was detected directly west of the East Pond. The U.S. Environmental Protection Agency (EPA) identified the Northeast Site as a solid-waste management unit. An Interim Corrective Measures Study (CMS) was developed and submitted to EPA and approval of this document was received in October 1991. An interim ground water recovery system for the Northeast Site was installed, and operation commenced in January 1992. The implementation of this interim corrective measures (ICM) system at this site is consistent with the regulatory goals of the EPA's Resource Conservation and Recovery Act Corrective Actions (Subpart S).

The ICM system, as initially installed, consisted of four recovery wells equipped with pneumatic recovery pumps, a holding tank, centrifugal transfer pumps, and approximately 2,500 feet (ft) of transfer and secondary containment piping. During 1993, the U.S. Department of Energy (DOE) proposed a reconfigured system for the site consisting of four shallow and three deep recovery wells. After EPA approved the system upgrade, the system was reconfigured and became operational on March 1, 1994.

Between August and October 1995, after EPA and Florida Department of Environmental Protection (FDEP) approval, a portion of the Northeast Site was excavated to remove debris and other materials that could inhibit future corrective measures. Location of the areas of excavation was based primarily on the results of a geophysical survey and knowledge of existing utility locations. Detailed descriptions of the debris removal activities were submitted to EPA and FDEP as part of the *Northeast Site Interim Measures Quarterly Progress Report* (DOE 1996).

In 1996, DOE submitted a Corrective Measures Implementation Plan (CMIP) to EPA Region IV and FDEP. This plan was approved by both regulatory agencies in 1997. As part of the Northeast Site CMS and CMIP, a pump-and-treat system in conjunction with a subsurface hydrogeologic barrier wall to prevent migration of the contaminant plume was identified as the best available technology. A pretreatment system for iron removal, an air stripper unit, and a tank for holding treated ground water before discharge to the Pinellas County Publicly Owned Treatment Works were recommended. The treatment system was constructed in early 1997 and became operational by July 1997 with seven Northeast Site recovery wells and two Building 100 recovery wells pumping to the system influent tank. Subsequently, several additional recovery wells were installed, and some of the old recovery wells were abandoned.

During 1997, anaerobic bioremediation and rotary steam stripping pilot tests were conducted in the northern and southern portions of the Northeast Site, respectively. These tests were designed by an Innovative Treatment Remediation Demonstration group of regulatory and industry members to provide remedial options at the Young - Rainey Science, Technology, and Research (STAR) Center. At the conclusion of the field tests in July 1997, pump-and-treat technology resumed at the Northeast Site.

An *Interim Measures Work Plan for Remediation of Non-Aqueous Phase Liquids at the Northeast Site* (IMW) was submitted to the FDEP in late November 2001. The purpose of this document was to present the plan for the interim measure to remediate NAPLs at the Northeast

Site. An ICM is warranted because it supports the long-term corrective action to remediate the dissolved phase contamination in the surficial aquifer to FDEP drinking water maximum contaminant levels (MCLs). Without this measure, NAPLs will continue to act as a source of dissolved contamination, resulting in contaminant concentrations in ground water well above the MCLs. The FDEP approved this document on January 10, 2002.

Concurrent with the preparation of the IMW Plan, an Environmental Checklist recommending Categorical Exclusion was prepared and approved by DOE on December 19, 2001. The Categorical Exclusion pathway was approved based upon the fact that the NAPL remediation of Area A is a small-scale, short-term cleanup action and the siting, construction, and operation of treatment facilities are temporary and pilot-scale in size.

This report describes the activities and events that took place to construct the remediation system for the period of May to September 2002. Construction of the in-situ thermal remediation system included mobilization, installation of the infrastructure required to support the well drilling phase, and construction of the steam enhanced extraction, electrical resistive heating (ERH), and treatment systems.

2.0 Summary of Activities

Prior to the start of construction, preliminary activities were conducted to enable the DOE's Contractor, S.M. Stoller (Stoller), to become intimately familiar with Stoller's Subcontractor, SteamTech Environmental Services (SES), and SES's method of operation and capability to perform the work. The first activity was a meeting between DOE, Stoller, and SES's key design, technical, and management personnel at the STAR Center. The meeting was held prior to acceptance of the final design. Items addressed were the final design criteria, site control, schedule, work sequencing, methodology, number and discipline of personnel, and types of material and equipment to be used. The second activity was a meeting between the Stoller and the SES key design, technical, and construction management personnel at the subcontractor's main office at Bakersfield, California. The objective was to observe the subcontractor's operation and inspect equipment to be used at the STAR Center. Finally, a Work Readiness Review was conducted at the STAR Center to provide objective evidence through independent reviews, that appropriate planning by project personnel had taken place to allow construction to proceed safely and effectively.

Construction was initiated on May 20, 2002. SES mobilized manpower and equipment after site and health and safety briefings were held for all project personnel.

Installation of the infrastructure in preparation for the well drilling phase took nine working days. It began with a utility locate covering the project site to mitigate the hazards of contacting a utility line during excavation and drilling. Concurrently, personnel removed the vertical electrode array boxes previously installed during drilling operations the year before. The wires were coiled and set in the ground and steel plates set over the wire to protect them and aid with location when the asphalt vapor cap was complete. A fence was erected to limit access to the site to authorized-trained personnel. Temporary underground utilities were installed for the temporary offices, sanitary facilities, and electrical power to run assembly equipment. The local public utility (Florida Power Corporation) continued with their installation of the 12.4 kV electric line to provide power for the 480-volt ERH. The type of ERH used at the site is known as Electro-Thermal Dynamic Stripping Process (ET-DSP^{TM}). Access/egress roads and lay-down areas for construction, operation, and maintenance were plated with crushed concrete. Vegetation was removed, a soil sub-base and limestone base placed, and a 2-inch asphalt cap laid over remediation Area A. The asphalt cap was installed to prevent storm water infiltration into the treatment area, to mitigate steam and contaminant-laden vapor from escaping into the atmosphere, and provide a stable area to drill the wells and erect the steam enhanced extraction and ERH systems. With completion of the asphalt cap, the drilling phase was ready to start.

The drilling phase was initiated on June 3, 2002, with preparatory work and a site and health and safety briefing and readiness review to assure that all issues related to drilling were addressed.

A total of 69 wells were drilled. Of those, 15 were steam injection (SI) wells drilled with a sonic drill to a depth of approximately 30 ft. The SI wells are drilled around the perimeter of the Area A remediation area. SI is used to form a wall of high pressure to force the contaminants inward to the central fluid and vapor extraction wells.

Twenty-eight deep wells with resistive heating electrodes in the Hawthorn Group (labeled EE) with long extraction screens in the surficial sands were drilled with auger drill rigs to a depth of approximately 35 ft. Extraction pumps were set at the bottom of the extraction screens in the surficial sands to pump contaminates to the treatment system. The ERH electrodes are set 5 ft into the Hawthorn Group to establish a hot floor to prevent downward contaminant migration and to lift contaminants up via steam bubble flotation.

Twenty-one shallow heating electrode wells with SI screens above the Hawthorn Group (labeled SE) were drilled with auger drill rigs to a depth of approximately 31 ft. These wells have ERH electrodes approximately 18 ft above the Hawthorn Group to heat the contaminants in the upper levels and SI points approximately 1 ft into the Hawthorn Group to contribute to the steam displacement of contaminants.

Two special wells with only heating electrodes in the Hawthorn Group (labeled DE) were installed in two strategic locations. In addition, three new vertical electrode array points were drilled to complement and complete the 33 in-situ direct temperature and electrode resistivity tomography monitoring points installed during drilling operations the year before.

Drilling was completed on June 28, 2002. All drilling and support equipment was decontaminated and the decontamination pad removed. During the drilling phase, work continued on installation of the infrastructure required to support the construction of the steam enhanced extraction, ERH, and treatment systems.

Installation and assembly of the steam enhanced extraction, ERH, and treatment systems started on July 1, 2002, and took 70 workdays to complete. The process started as personnel located the vertical electrode array wells buried under the asphalt cap and began cutting the fiberglass and carbon steel SI well pipes to the level of the pad. Specially fabricated pipe supports to carry the waste stream, supply piping, and electrical cable to and from the wells and treatment system were placed with the main line running through the center of the asphalt cap and four lateral lines running perpendicular each way to the wells.

A treatment system pad of the same design as the asphalt cap was installed to set treatment system equipment on and serve as secondary containment. However, additional secondary containment was installed later for the NAPL tanks. The containment is a flexible plastic membrane 12 ft wide by 16 ft long and 12 inches high. In addition to the asphalt treatment system pad, the subcontractor poured two concrete pads and constructed various gravel pads to support and set equipment.

As soon as the pipe supports were set, welders began assembly of the carbon steel pipe and fittings. Concurrently, a pipe fitting crew started installing the carbon steel threaded pipe. The main line effluent and supply piping running to and from the wells and the treatment system consists of a 6 inch contaminated vapor header, 3 inch steam supply header, 2 inch contaminated water discharge header, 1 inch compressed air supply header, 1 inch fresh water supply to the resistive heating electrodes, and a 1 inch return water from the resistive heating electrodes.

Florida Power completed their installation of the 12.4 kV electric line to the switchgear and electricians from SES's ERH subcontractor, McMillian-McGee Corp, continued the electrical work from the switchgear through the 480-volt transformer to the five power distribution systems for the 480-volt ERH and the motor control center for the treatment system.

Equipment was delivered to the site as individual pieces and on skids and trailers as complete prefabricated systems. Equipment and systems delivered to the site included: 3,000 gallon fuel tank and containment system, vapor treatment system skid, steam generator trailer (6,000 pound per hour rated), water softener system, back up generator, air compressor, water cooling tower, vapor carbon canister system, water and vapor carbon primary and polishing tanks, treated water effluent tank, light non-aqueous phase liquid and dense non-aqueous phase liquid holding tanks, and motor control center.

As the construction of the steam enhanced extraction, electric resistive heating, and treatment systems continued, additional personnel were brought to the site to support the increasing activity level. Nearing completion, all systems were being worked on concurrently.

A treated water effluent line was installed to the Northeast Treatment System and connected to the treatment system's effluent discharge water line. The water line connection includes a back-check valve and a flow and rate metering system.

The lower tier subcontractor for the electric resistive heating completed installation of the electrical wiring and water circulation lines that feed the electrodes in the EE, SE, and DE wells. After the internal circuitry for the five Power Distribution System units was tested and the final connections from each well lead were wired into the units, touch potential tests were conducted to determine voltage leaks from the underground electrodes. The results of the tests ranged between ¼ volt and 9 volts, well within the accepted criterion of 14 volts.

The effluent and supply piping running to and from the wells and the treatment system was both air and hydrostatically tested. The air test was used to find initial leaks. The hydrostatic tests exceed the working pressure of the line by a factor accepted in the industry.

Two additional trailers were set up on site. A control room trailer was set to house the equipment for the in-situ direct temperature system and the electrode resistivity tomography system and a communications trailer was set to house equipment used to convert a broadband signal from off site to the fiber optic cable installed on the site. The communication system enables the subcontractor to monitor the remediation system remotely.

Personnel continued final pipe and fitting connections from the pipe headers to the wellheads and appurtenance on the wellheads. The steam enhanced extraction, ERH, treatment system, and all supporting systems were tied in and final connections made. Motors, pumps, backup generator, air compressor, steam generator, ERH, treatment system, and monitoring systems were started, checked, and tested.

When construction was complete, an Operations Readiness Review was conducted on September 24, 2002. The readiness review was attended by DOE, Stoller, and SES's key design, technical, and management personnel. Issues with Project and Operations Management; Quality Assurance/Quality Control; Environmental Compliance and Waste Management; Project Plans and Procedures; and Health and Safety were resolved and completed. A further review of the Area A NAPL Remediation Project was conducted on September 25, 2002, by DOE, Stoller, and SES, including an inspection of the remediation system to ensure that the system was complete per the design and the criteria listed in the Operations Readiness Review and remediation system checklists developed by Stoller, and SES's key design, technical, and management personnel. In addition, a safety stand down was conducted on September 26, 2002, to ensure a safe and complete operation at startup. The remediation system went into operation on Thursday, September 26, 2002. Several extraction wells were turned on to begin hydraulic control of ground water flow in the treatment area.

3.0 Deviations

There were no deviations from the work plan.

4.0 Problems

Delays due to extreme summer weather events, late delivery of process equipment, and an underestimation by the subcontractor of the time and resources necessary to assemble and test all the process components resulted in approximately a 1-month slippage in the construction schedule. However, all required construction activities were completed prior to the scheduled implementation of system operations of September 30, 2002.

5.0 Upcoming Activities

During the first week of October, startup activities for the NAPL Area A treatment system continued with hydraulic and pneumatic control being achieved. ERH of the Hawthorn Group will then begin and shortly thereafter ERH of the surficial aquifer material will commence. SI is anticipated to start sometime during the later part of October 2002. By mid December, the entire site should be heated to the target temperature, which will be maintained until the completion of operations in late January 2003. As part of operations, pressure cycling will begin in mid December and will continue until the end of operations. Pressure cycling is when steam is injected at a relatively high pressure (i.e., 25 pounds per square inch [psi]) for approximately 1 day and then the steam injection pressure is lowered to 5 to 10 psi for 1 day. This technique is used to remove additional contamination that may not come out by normal steaming methods.